

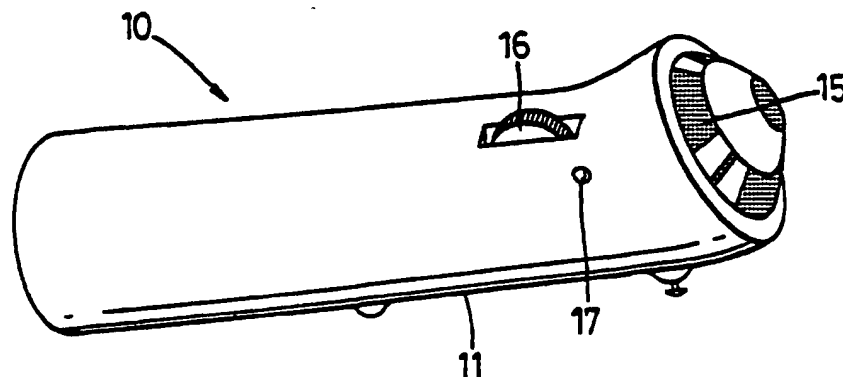
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/IB95/00599</b></p> <p>(22) International Filing Date: <b>18 July 1995 (18.07.95)</b></p> <p>(71) Applicant (for all designated States except US): <b>COMENTO AB [SE/SE]; P.O. Box 3071, S-161 03 Bromma (SE).</b></p> <p>(71)(72) Applicant and Inventor: <b>FESSÉ, Gunnar [SE/SE]; Almhagsvgen 12 C, S-178 38 Ekerö (SE).</b></p>	<p>(81) Designated States: <b>AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b> <i>With international search report.</i></p>	

(54) Title: PERSONAL LISTENING DEVICE



## (57) Abstract

A personal listening device includes an amplifier with an automatic gain control circuit for automatically limiting at the amplified output the amplitude of electrical signals supplied to the signal input. A directional microphone is connected to the signal input of the amplifier, the directional microphone produces electrical signals representative of sounds prevalent at a position at which the microphone is directed. The amplifier and directional microphone are mounted in an ergonomically designed housing for easy direction of the microphone. Earphones or a hearing aid are connected to receive the amplified electrical signals from the amplifier and convert the electrical signals to sound.

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5

## PERSONAL LISTENING DEVICE

Technical Field

10           This invention relates to personal listening devices.  
          More particularly, the present invention relates to  
a personal listening device for hearing impaired people.  
          In a further and more specific aspect, the instant  
invention concerns a personal listening device for  
15   hearing impaired people with light to moderate hearing  
impairments.

Background Art

20           Many older people are healthy and live active lives  
well into their golden years. But the risk of becoming  
ill or disabled increases with the years. This applies  
particularly to hearing. The percentage of people with  
impaired hearing increases dramatically with age. Also,  
25   in most instances the amount of hearing impairment  
increases with age.

          Generally, as a person's hearing gradually fails,  
they must gradually increase the sound output, e.g. turn  
up the sound on radios, televisions, etc. Ultimately,  
30   they must purchase some sort of hearing aid. Most  
listening devices are limited to an in-the-ear device  
that simply amplifies all sound approximately equally  
(sometimes amplifying certain tones a greater amount).  
A major problem with prior art listening devices which  
35   amplify all ambient sounds is that a hearing impaired  
person has great problems hearing what any one person  
says when other people are talking at the same time or  
in noisy places. The microphone in a conventional

5 listening device is omnidirectional (picks up the sound approximately equally from all directions).

Further, the amplification in conventional listening devices is fixed and, after being set with a manual control, remains constant regardless of the sound or noise  
10 level. Thus, sudden loud noises, etc. are over amplified and can even be painful to the wearer. Also, because of the constant amplification, a conventional listening device is very sensitive to acoustic feedback when the distance between the microphone and headphones is too  
15 close and/or the volume control is set too high.

It would be highly advantageous, therefore, to remedy the foregoing and other deficiencies inherent in the prior art.

Accordingly, it is an object of the present invention  
20 to provide an improved personal listening device.

Another object of the present invention is to provide an improved personal listening device that operates substantially automatically.

And another object of the present invention is to  
25 provide an improved personal listening device that can be worn or positioned in a convenient location.

Yet another object of the present invention is to provide an improved personal security system which can be used even in very noisy environments.

30

#### Disclosure of the Invention

Briefly, to achieve the desired objects of the instant invention, in accordance with a preferred  
35 embodiment thereof, a personal listening device includes an amplifier with an electrical signal input and an amplified electrical signal output, and an automatic gain control circuit for automatically limiting at the amplified electrical signal output the amplitude of

5 electrical signals supplied to the electrical signal input. A directional microphone having an electrical signal output is connected to the electrical signal input of the amplifier, the directional microphone produces electrical signals at the electrical signal  
10 output representative of sounds prevalent at a position at which the microphone is directed.

The amplifier and directional microphone are mounted in a common portable housing ergonomically fashions as an elongated tubular structure with the  
15 directional microphone mounted adjacent one end and directed at an angle to the elongated tubular structure for ease in automatically or manually directing the microphone at a preferred position. Also, The common portable housing is constructed to be carried by a neck  
20 strap, which generally points the directional microphone in a direction in which a wearer is facing when the common portable housing is carried by the neck strap.

The personal listening device includes in addition a transponder connected to receive electrical signals  
25 from the amplified electrical signal output of the amplifier and convert the electrical signals to sound.

#### Brief Description of the Drawings

30 The foregoing and further and more specific objects and advantages of the instant invention will become readily apparent to those skilled in the art from the following detailed description of preferred embodiments thereof taken in conjunction with the drawings in which:

35 FIG. 1 is a top perspective view of a personal listening device, constructed in accordance with the present invention;

FIG. 2 is a bottom perspective view of the personal listening device of FIG. 1;

5        FIG. 3 is a schematic view of the personal listening device of FIG. 1; and

         FIG. 4 is a view of an accessory for the personal listening device of FIG. 1.

5     Best Mode for Carrying Out the Invention

Turning now to the drawings in which like reference characters indicate corresponding elements, attention is first directed to FIG. 1 which illustrates a personal listening device 10 including a common portable housing 11. Common portable housing 11 is formed as an elongated tubular structure with a directional microphone 15 mounted adjacent one end and directed at an angle to the elongated tubular structure. FIG. 1 generally illustrates the upper portion of housing 11 and includes a dual function on/off switch and volume control 16. An indicator light 17 is positioned adjacent on/off switch 16 so as to be easily viewable when operating on/off switch 16.

Referring to FIG. 2, a bottom view of housing 11 is illustrated, showing a battery compartment 18 which contains batteries for powering personal listening device 10. Also, a pre-selector switch 19 is illustrated which is utilized to provide specific tone control (e.g. selecting a specific frequency response, such as reduction of high or base tones). A pair of mounts 20 are cast in housing 11 for connecting a neck strap 25 to housing 11 for affixing personal listening device 10 about the neck of a user. It should be specifically noted that housing 11 is formed as an elongated tubular structure with directional microphone 15 mounted adjacent one end and directed at an angle to the elongated tubular structure so as to generally point directional microphone 15 in a direction in which the wearer is facing when common portable housing 11 is carried by neck strap 25. Further, common portable housing 11 is ergonomically designed to fit the hand or to be conveniently carried by neck strap 25 about the neck of a user. A headphone jack 26 is provided on the

5 side of housing 11 for the connection of a headphone (not shown).

Referring specifically to FIG. 3, a schematic diagram of personal listening device 10 is illustrated. Directional microphone 15 is connected directly to a single transistor amplifier 30. An input jack 32 is provided in circuit with directional microphone 15 so that other inputs can be connected to amplifier 30 and directional microphone 15 will be automatically disconnected from the circuit. In the normal mode of operation, electrical signals input to amplifier 30 from directional microphone 15 are amplified and supplied through an automatic gain control circuit 35, illustrated herein as an integrated circuit, to a two input differential amplifier 40. In this embodiment the integrated circuit is a compander I.C. used as a level limiter. In case of high amplitude incoming signals, the I.C. regulates the amplitude successively and very smoothly down to predetermined levels. Differential amplifier 40 provides a dual output to an output jack 45 designed to receive, a transponder which may be for example, a pair of earphones 50 connected thereto. Amplifier 30 and differential amplifier 45 receive power from a power supply 55, which is in turn connected to one or more batteries 56 positioned in battery compartment 18.

In the specific embodiment illustrated in FIG. 3, the values of the various components of amplifier 30, automatic gain control circuit 35 and differential amplifier 40 are generally as follows:

35

C1, C2, C4	220nF
C3	10nF
C5,	100nF



5           C6, C7, C9, C10, C13, C15    1uF  
            C11, C12, C14               47uF

            R1, R4        4.7kOhms  
            R2, R3        188k

10           R5            1.8k  
            R6            330  
            R7            33k  
            R8, R9        18k  
            R10           15k

15           R11           108k  
            R12, R13     27  
            R14           100

            IC1         TDA7050T

20           IC2         NE575  
            T1          BC847  
            L1          LED  
            M1          DIRECTIONAL MICROPHONE  
            S1, VR1     SWITCH/VOLUME CONTROL

25           J1, J2     3.5mm Jack  
            S2          DIL SWITCH

Batteries are 2 1.5 volt penlight batteries.

In the operation of personal listening device 10,  
30 housing 11 is ergonomically designed to fit conveniently  
in the hand or to hang about the neck of an operator by  
neck strap 25. In either application, directional  
microphone 15 is conveniently positioned in housing 11  
to be substantially automatically directed toward a  
35 position in which the operator is looking, e.g. someone  
with whom the operator is conversing. Therefore,  
directional microphone 15 picks-up the sounds or voice  
from the person with whom the operator is conversing and  
all or most of the other noise or conversations in the

5 area are eliminated. Additionally, automatic gain control circuit 35 automatically maintains the amplitude of the output signals from amplifier 40 at a preset amplitude. Any sudden loud noises that might occur are automatically reduced to the preset level by automatic  
10 gain control circuit 35 so that the operator is protected from sudden loud noises, back ground noise, other conversations, etc. Further, the risk of acoustic feedback from some source of sound is substantially removed.

15 Referring to FIG. 4, an accessory transponder for coupling the electrical signals from amplifier 40 to a hearing aid is illustrated. The accessory includes an induction loop 55 connected to be plugged into output jack 45 in place of earphones 50. When the operator  
20 desires to connect listening device 10 to a conventional hearing aid, rather than using earphones 50, induction loop 55 is simply plugged into output jack 45 and loop 55 is placed around the neck. The conventional hearing aid can then be set to T for magnetic coil operation and  
25 sounds (electrical signals representative of the sounds) are transmitted directly to the hearing aid from personal listening device 10.

In some special applications, other inputs, such as a tie clip microphone (not shown) may be utilized in  
30 place of directional microphone 15. Such, special equipment is attached to personal listening device 10 through input jack 32.

Accordingly, an improved personal listening device is disclosed which operates substantially automatically  
35 and which can be worn or positioned in a convenient location for individual conversations and the like. Further, the improved personal security system can be used in virtually any noise environment and picks-up speech in close communication very clearly. The

5 personal listening device substantially reduces background noise and automatically regulates the amplification to a pre-set volume. Also, the risk of acoustical feedback is substantially eliminated, as well as the risk of sudden loud noises being unduly  
10 amplified. In addition, the structure is ergonomically designed to conveniently fit the hand, hang around the neck, or to be set on a desk or the like for easily and conveniently picking-up conversations between individuals.

15 Accordingly, an improved personal listening device is disclosed which is substantially automatic and can be conveniently, if not automatically, positioned by the wearer to pick-up personal or individual conversations. Further, the improved personal listening device is light  
20 and wearable as an attractive piece of jewelry (if desired) so that it can be conveniently included in the wearer's outfit under virtually any circumstances.

Several advantages of the disclosed personal listening device are the simplicity and ease of use and  
25 the great versatility. Also, because of the substantially automatic features of the volume and microphone direction, the personal listening device is very easy to use.

Various modifications and changes to the  
30 embodiments herein chosen for purposes of illustration will readily occur to those skilled in the art. For example, housing 11 can be formed and assembled in a variety of ways while still performing the stated functions. Further, a variety of different circuits may  
35 be utilized to form amplifiers 30 and 40 and automatic gain circuit 35 and a variety of apparatus may be utilized to attractively position the personal listening device conveniently on the body.

5           The foregoing is given by way of example only.  
Other modifications and variations may be made by those  
skilled in the art without departing from the scope of  
the invention as defined by the following claims.

10           Having fully described and disclosed the present  
invention and preferred embodiments thereof in such  
clear and concise terms as to enable those skilled in  
the art to understand and practice same, the invention  
claimed is:

5

## CLAIMS

1. A personal listening device comprising:  
an amplifier with an electrical signal input and an  
amplified electrical signal output, and an automatic  
gain control circuit for automatically limiting at the  
10 amplified electrical signal output the amplitude of  
electrical signals supplied to the electrical signal  
input; and  
a directional microphone having an electrical  
signal output connected to the electrical signal input  
15 of the amplifier, the directional microphone producing  
electrical signals at the electrical signal output  
representative of sounds prevalent at a position at  
which the microphone is directed.
- 20 2. A personal listening device as claimed in claim 1  
wherein the amplifier and directional microphone are  
mounted in a common portable housing.
- 25 3. A personal listening device as claimed in claim  
2 wherein the common portable housing is an elongated  
tubular structure with the directional microphone  
mounted adjacent one end and directed at an angle to the  
elongated tubular structure.
- 30 4. A personal listening device as claimed in claim 1  
wherein the common portable housing is constructed to be  
carried by a neck strap.

5           5. A personal listening device as claimed in claim  
4 wherein the common portable housing constructed to be  
carried by a neck strap is further constructed to  
generally point the directional microphone in a  
direction in which a wearer is facing when the common  
10 portable housing is carried by the neck strap.

          6. A personal listening device as claimed in claim  
4 including in addition a transponder connected to  
receive electrical signals from the amplified electrical  
15 signal output of the amplifier and convert the  
electrical signals to sound.

          7. A personal listening device as claimed in claim 6  
wherein the transponder includes earphones.  
20

          8. A personal listening device as claimed in claim 6  
wherein the transponder includes a hearing aid and means  
for coupling the electrical signals thereto.

25           9. A personal listening device as claimed in claim  
8 wherein the means for coupling the electrical signals  
to a hearing aid includes an induction loop.

5           10. A personal listening device comprising:

          an amplifier with an electrical signal input and an  
          amplified electrical signal output, and an automatic  
          gain control circuit for automatically limiting at the  
          amplified electrical signal output the amplitude of  
10       electrical signals supplied to the electrical signal  
          input;

          a directional microphone having an electrical  
          signal output connected to the electrical signal input  
          of the amplifier, the directional microphone producing  
15       electrical signals at the electrical signal output  
          representative of sounds prevalent at a position at  
          which the microphone is directed; and

          a transponder connected to receive electrical  
          signals from the amplified electrical signal output of  
20       the amplifier and convert the electrical signals to  
          sound.

          11. A personal listening device as claimed in claim  
25       10 wherein the transponder includes earphones.

          12. A personal listening device as claimed in claim  
30       10 wherein the transponder includes a hearing aid and  
          means for coupling the electrical signals thereto.

          13. A personal listening device as claimed in claim  
35       12 wherein the means for coupling the electrical signals  
          to a hearing aid includes an induction loop.

          14. A personal listening device as claimed in claim 1  
          wherein the amplifier and directional microphone are  
          mounted in a common portable housing.

- 5        15. A personal listening device as claimed in claim 14 wherein the common portable housing is an elongated tubular structure with the directional microphone mounted adjacent one end and directed at an angle to the elongated tubular structure.



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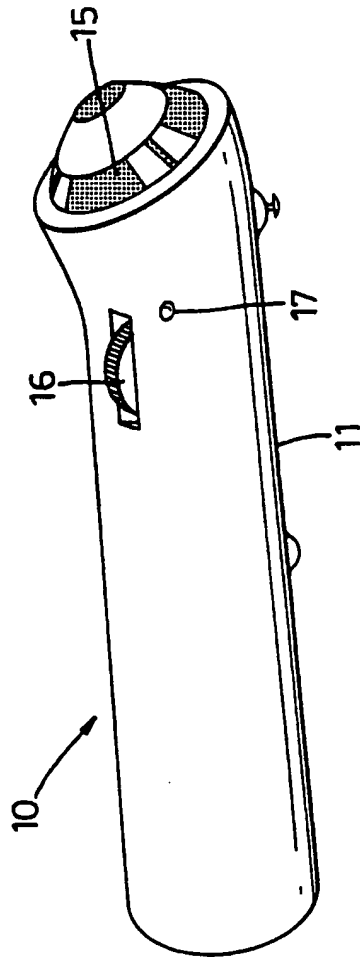


Fig. 1

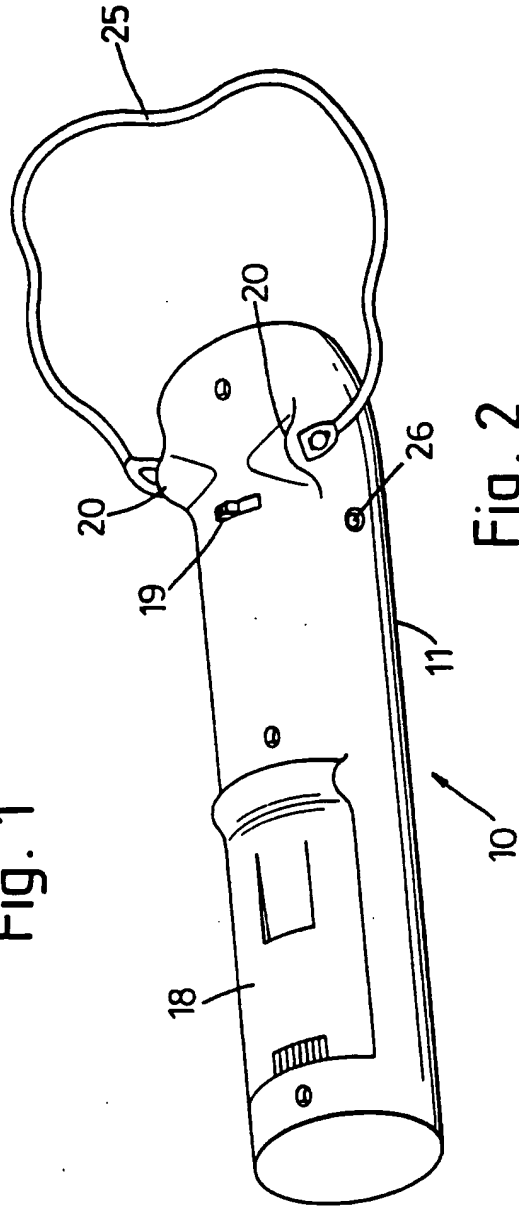
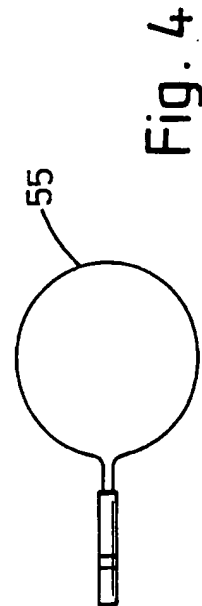
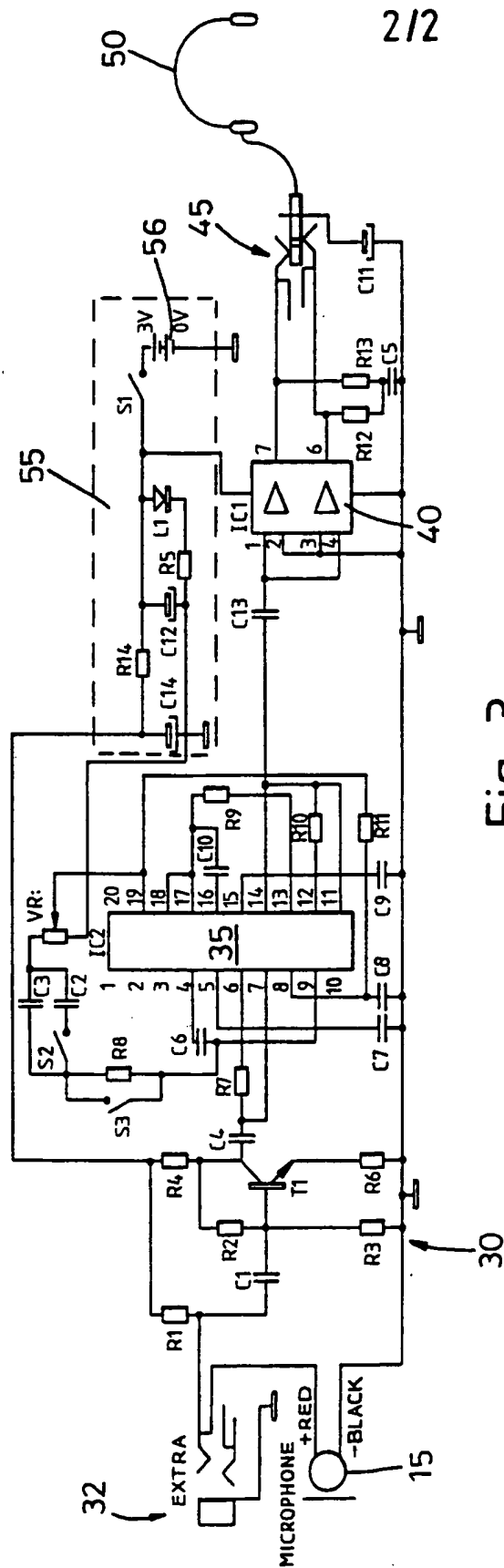


Fig. 2



# INTERNATIONAL SEARCH REPORT

Int. No. Application No  
PCT/IB 95/00599

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 H04R25/00 H04R27/02 H04R25/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,3 875 349 (RUEGG) 1 April 1975  see column 2, line 61 - column 3, line 50; figures	1,2,10, 14
X	WO,A,92 11738 (SELECT HEARING SYSTEMS LTD) 9 July 1992  see page 10, line 6 - page 24, line 5; figures	1-6, 8-10, 12-15
A	GB,A,2 204 759 (CAREY) 16 November 1988  see claims; figures	1,7,10, 11
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

25 March 1996

Date of mailing of the international search report

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 027 410 (WILLIAMSON ET AL.) 25 June 1991 see column 5, line 45 - column 6, line 40; figure 1 ---	1,10
A	FR,A,2 652 979 (CONCEPT DEVELOPPEMENT SARL) 12 April 1991 see page 4, line 1 - page 7, line 23; figures -----	1,10

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International Application No.

PCT/IB 95/00599

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